



**ENERGY DELIVERY ENGINEERING  
SPECIFICATION  
EDEN-511**

**SPECIFICATION FOR  
PRESTRESSED SPUN CONCRETE DISTRIBUTION  
AND TRANSMISSION POLES**

**March 12, 2004**

LAKELAND ELECTRIC  
ENERGY DELIVERY ENGINEERING  
LAKELAND, FL

## LIST OF REVISIONS

03/10/04            Added note 1.2.3, revised note 1.5.1 G.

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## 1.0 GENERAL REQUIREMENTS

### 1.1. GENERAL DESCRIPTION

- 1.1.1. This specification covers the design, materials, and fabrication for furnishing prestressed spun concrete distribution and transmission poles as indicated in the attachments.
- 1.1.2. Structures shall have a neat and pleasing appearance. The shafts of spun poles shall be tapered one-piece (or two piece as alternate) sections having a circular shape. Shafts shall be provided with holes or threaded inserts (if specified) for attaching accessories consisting of horizontal post insulators, miscellaneous attachment brackets, and bolting materials. The drilling and structural information for each type of pole will be provided on the attachments for each pole type.
- 1.1.3. Except as otherwise specified, prestressed concrete poles shall be produced in accordance with the recommendations of the Prestressed Concrete Institute as published in their "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products".

### 1.2. DRAWINGS AND CALCULATIONS

- 1.2.1. Drawings for shop fabrication and field erection of all materials shall be prepared, checked, and submitted to Lakeland Electric Engineering department as specified below:

Lakeland Electric  
Energy Delivery Engineering – A71  
501 E Lemon Street  
Lakeland, Florida 33801-5079  
(863) 834-6482  
Attn: Civil Engineer
- 1.2.2. Drawing shall indicate details and dimensions as required to enable the Owner to coordinate hardware attachment and electrical clearances. Design data shall be submitted (if requested) with the Proposal which shall include calculations indicating the adequacy of each structure and its appurtenances regarding strength and deflections. The accuracy of the design of the structures and their components, based on the loads indicated on the Owners drawings, is the sole responsibility of the Contractor. The yield strength of the prestressed tendons used for shaft design shall be determined by the appropriate ASTM specification. The yield strength of the stress relieved wire shall be determined in accordance with ASTM A421.
- 1.2.3. Moment capacities through out the pole length shall be furnished for all classes and heights for use with PLS-Cadd design software.
- 1.2.4. Each detail drawing shall include, as a minimum, the following information:
  - A) Dimensions, length, and embedment
  - B) Description and location of the steel reinforcement
  - C) Twenty-eight day strength of concrete and detention strength
  - D) All necessary stressing information
  - E) Size, description, quantity, and location of all holes and hardware that are a part of the structure
  - F) Weight and location of center of gravity of the structure

- G) Location of pickup points and storage points
- H) The zero tension load capability expressed in terms of load 2 feet from the tip.
- I) The ultimate load capability expressed in terms of load 2 feet from the tip.
- J) Calculated deflection under the zero tension load

1.2.5. The shafts shall be designed to limit the shaft top deflection to 10 percent of shaft height, including three percent due to foundation rotation, above the ground under the ultimate load condition except as otherwise indicated on the drawing. The Manufacturer shall include the effects of the rotation – deflection in the calculations of final deflected pole stresses.

### **1.3. CODES AND STANDARDS**

1.3.1. Materials furnished under this section shall conform to the applicable codes or standards.

### **1.4. MATERIALS**

- 1.4.1. Materials shall be as outlined and used as specified in ACI 318 (latest revision).
- 1.4.2. The chemical properties of materials used in the manufacture of the structures shall be such that noticeable pyrite staining and efflorescence due to sulfates and/or chlorides will not occur.
- 1.4.3. Inserts shall be noncorrosive material used according to manufacturer's specifications.

### **1.5. PRELIMINARY ACCEPTANCE**

- 1.5.1. Complete reports representing the concrete materials proposed for all prestressed concrete poles furnished under these specifications shall be available for the Owner's review before beginning fabrications. These reports shall include the following information for each proposed concrete mix:
  - A) Brand and type of Portland cement used
  - B) Source, gradation, and quality of all aggregates
  - C) Proportions of the concrete mix by weight
  - D) Manufacturer and brand name of all admixtures used
  - E) Total air content of the concrete when placed in the forms
  - F) The proposed slump of the concrete at the time it is placed
  - G) Design 28 day compressive strength

### **1.6. MANUFACTURE**

- 1.6.1. The prestressed concrete poles shall be manufactured by a manufacturer having not less than 18 months satisfactory experience in similar work.
- 1.6.2. All prestressed concrete poles furnished under these specifications shall be new, undamaged members which have not been previously rejected for any reason and shall be manufactured per these specifications. Members which are damaged or which do not meet the requirements of these specifications will be rejected.
- 1.6.3. Prestressed concrete poles shall be designed for the loading indicated on the drawings. No welding of prestress strands will be permitted.

- 1.6.4. The minimum distance from strands or voids to the outside concrete surface shall be 0.75 inch. The minimum center-to-center spacing of strands or voids shall be four strand diameters.
- 1.6.5. Placement of reinforcement shall be symmetrical so that the pole can support the required loading applied in any direction.
- 1.6.6. Holes and voids shall be accurately located and sized. Holes or voids indicated on the drawings shall be sleeved. Holes and voids shall be straight and of uniform diameter and shall be perpendicular to the pole axis unless otherwise indicated.
- 1.6.7. The pole design shall provide for both multiple points and one point lifting. Lifting points shall be clearly indicated on the poles and shall be identified as multiple points and one point lifting points.

## **1.7. QUALITY CONTROL**

- 1.7.1. Manufacturing and testing procedures shall be in general compliance with ACI Practices and/or Division I, Division II, Division III, Section I of Division IV, and Division V of P.C.I. MNL-116, published by the Prestressed Concrete Institute.

## **1.8. TEST REPORTS**

- 1.8.1. Certified mill reports of the mechanical properties of the prestress tendons shall be available to the Owner for review.
- 1.8.2. Certified 28-day concrete compressive strength reports for each structure shall be kept on file by the manufacturer and be available for review by the Owner. Concrete compressive strength tests for a period less than 28 days will be acceptable, provided the manufacturer can correlate these reports to 28-day strengths. If the manufacturer furnishes strength reports for a period less than 28 days, actual 28-day compressive strength tests for every tenth structure produced shall be furnished.

## **1.9. DIMENSIONAL TOLERANCES**

- 1.9.1. Dimensional tolerances not indicated on the drawings shall be in accordance with the following.
  - A) Pole length (+ or -2 inches)
  - B) Width and depth or diameter (+ or -0.25 inch)
  - C) Straightness of pole (0.25 inch for each 10 feet in length, in one plane and one direction only)
  - D) Bolt hole or insert spacing (+ or - 0.5 inch)
  - E) Bolt hole or insert spacing within a related group (+ or - 0.125 inch)
  - F) Bolt hole or insert orientation (0.75 degrees or 0.125 inch, whichever is greater.)
  - G) Bolt hole diameter (+ 0.125 inch, - 0 inches)

## **1.10. CONCRETE SURFACES**

- 1.10.1. Surfaces of centrifugal casings shall be smooth and free from cracks. Attach the manufacturer's identification plate to the shaft before the casting in such a manner as to fit the contour of the shaft.
- 1.10.2. After the shaft is removed from the form all small cavities caused by air bubbles, honeycomb spots or other small voids shall be cleaned, saturated with water, and

then carefully pointed with mortar. A small cavity is defined as one not larger than 1.25 inch in diameter or deeper than 0.25 inch. Larger cavities not exceeding 2 inches long shall be repaired by opening the cavity sides on a 1 to 1 slope with a mechanical grinder, cleaning thoroughly, and patching with a mixture that will blend with the concrete.

- 1.10.3. Shafts with cavities larger than the foregoing shall be rejected.
- 1.10.4. The top and butt of each concrete pole shall be solid for at least 12 inches with a two inch diameter drain hole in the butt.
- 1.10.5. Plastic or rubber plugs shall be furnished in each bolt hole.

#### **1.11. PRESTRESS TENDONS**

- 1.11.1. Manufacturer shall burn off prestress tendons below the surface of the shaft and then seal with an epoxy protective coating in accordance with the epoxy manufacturer's instructions.

#### **1.12. GROUNDING**

- 1.12.1. Bronze NEMA 2 Hole grounding pads with tapped, holes shall be cast in the pole in the locations indicated on the drawings. An internal #2 AWG, 7 strand copper cable shall extend the length of the shaft and shall be connected to each pad using an exothermic welded process (preferred) or a mechanical connector. At least two prestressing cables shall be connected to the internal #2 AWG ground near the top and bottom of the shaft.
- 1.12.2. A continuity check shall be performed following fabrication of the pole. The Contractor shall remedy any condition deemed unacceptable by the Owner.
- 1.12.3. Inserts for an external ground wire shall be AKI International P35T (or equivalent) metal inserts with a clip for #4 solid copper ground wire on three foot centers from 6 inches below top of pole to the center of the bottom ground pad.

#### **1.13. POLE CAP**

- 1.13.1. Manufacturer shall furnish a 14 gauge galvanized pole cap with a two inch lip attached to the concrete pole tip by epoxy. Pole cap shall have a ½ inch ground nut for a ground lug connector located in line with ground clips. The top of the pole under the pole cap shall be finished as if it were without a galvanized cap.

#### **1.14. MATERIAL AND WORKMANSHIP**

- 1.14.1. All material and workmanship shall be subject to inspection, examination, and testing by the Owner at any time and at all places including material procurement, during manufacturing and storage, while in transit, and at the structure destination.

#### **1.15. IDENTIFICATION PLATE**

- 1.15.1. Manufacturer shall stamp structure identification data on a metal plate installed approximately 5 feet above the ground line. The plate shall be approximately 4 inches by 4 inches by ¼ inch with the following information stamped into the plate with letters not less than ¼ inch high:
  - A) The structure type (if required).
  - B) Structure number (if required).
  - C) The year of manufacture.

- D) The structure length/embedment.
- E) The vendor's name.
- F) The pole weight.
- G) The ultimate design load capability and the zero tension load capability expressed in terms of load 2 feet from tip.

## **1.16. CENTER OF GRAVITY**

1.16.1. The manufacturer shall mark the center of gravity on each pole.

## **1.17. HANDLING**

1.17.1. Poles may be removed from the mold any time at the discretion of the manufacturer.

1.17.2. Handling of the poles and galvanized structure components including loading, hauling, and unloading shall be done with care to prevent breaking, chipping, overstressing, or damage to any protective coating. All poles and components that are damaged or defective in any way which, in the opinion of the owner affects adversely the strength or serviceability of the unit, shall be rejected and removed from the site. Handle poles at the lift points only.

1.17.3. Care shall be taken to prevent dropping of poles and to prevent impact of any kind. If poles are stacked in the storage areas, blocks shall be carefully placed so that they are located directly above or below each other and at or near the lift point(s) so as to avoid bending loads due to weight of the superimposed poles. Any structures which have a noticeable crook or sweep resulting from improper storage or handling will be rejected.